Homework 5 – Due Wednesday, February 27, 2008 before the lecture

Please refer to the general information handout for the full homework policy and options.

Page limit You can submit **at most** 1 page per problem, even if the problem has multiple parts. If you submit a longer solution for some problem, only the first page will be graded. This homework contains 4 problems, worth 10 points each.

Reminder Collaboration is permitted, but you must write the solutions *by yourself without assistance*, and be ready to explain them orally to the instructor if asked. You must also identify your collaborators. Getting solutions from outside sources such as the Web or students not enrolled in the class is strictly forbidden.

Exercises Please practice on all exercises and solved problems in Chapters 4 and 5. The material they cover may appear on exams. (Exam 1 contained a solved problem from assigned chapters.)

Problems

0. (**Countable and uncountable sets**) (a) Book, 4.6; (b) Book, 4.7. (Do not hand in.)
1. (**Descriptions of deciders**) Book, 4.28. *Hint:* Use a proof by contradiction.
2. (**TMs that move left on the left-most cell**) Book, 5.14.
3. (**TMs that move left**) Book, 5.15.
4. (**Turing-unrecognizable languages**) Let FIN = $\{\langle M\rangle |\ M$ is a TM that accepts only a finite number of strings$\}$. Prove the following statements about FIN.
   (a) FIN is not Turing-recognizable.
   (b) $\overline{\text{FIN}}$ is not Turing-recognizable (i.e., FIN is not co-Turing-recognizable.)